Item 87N FY96
04DS1
09 September

1995

PURCHASE DESCRIPTION

RADIO TEST SET

TSMNP-K

1.0 GENERAL This procurement requires a portable radio test set for use with radio receiving and transmitting equipment.

2.0 CLASSIFICATION The equipment shall conform to the requirements of MIL-T-28800 Type II, Class 3, Style C, and Color R for shipboard applications.

(a) Non-operating temperature: -40° to 70°C
(b) Altitude requirement not invoked

3.0 OPERATIONAL REQUIREMENTS The equipment shall be capable of signal generation, monitoring, amplitude level and frequency measurement, power measurement, modulation analysis, and receiver signal-to-noise measurement within the parameters and accuracies specified herein.

3.1 RF Signal Generator

3.1.1 Generator frequency range: 400 kHz to 999.99 MHz tunable in 100 Hz increments

3.1.2 Generator frequency accuracy: Equal to the time base accuracy (3.11) + 0.5 Hz

3.1.3 Residual FM: 25 Hz rms; 0.3 to 3 kHz post detection bandwidth

3.1.4 Generator output power: At least -110 dBm to -40 dBm in 0.1 dB or smaller increments
3.1.4.1 Accuracy: ±2.0 dB

3.1.5 Generator spectral purity:
a. Harmonics: -25 dBc
b. Non-harmonics: -50 dBc
c. SSB phase noise: -108 dBc/Hz at 20 kHz offset

3.1.6 Modulation: FM and AM from internal source, external source, and supplied microphone
3.1.6.1 Frequency Modulation:
3.1.6.1.1 Deviation: 0 to 25 kHz peak from 1 MHz to 999.99 MHz
3.1.6.1.1.1 Accuracy: ±8% at 1 kHz rate and 10 kHz deviation

3.1.6.1.2 Amplitude modulation:
3.1.6.1.2.1 Frequency Response: 20 Hz to 10 kHz

3.1.6.1.2.2 Depth: 0 to 90% from 1.5 MHz to 999.99 MHz RF
3.1.6.1.2.3 Accuracy: ±5% at 1 kHz rate and 50% depth

3.1.7 RF Connector: Type-N female

3.2 RF Signal Analyzer

3.2.1 Analyzer frequency range: 400 kHz to 999.99 MHz

3.2.2 RF analyzer input sensitivity: 5 mW or less

3.2.3 Single sideband demodulator: A single sideband demodulator or other means shall be provided for detecting single sideband transmissions.

3.2.4 RF frequency error measurement: The analyzer shall indicate the difference in frequency of the RF signal under test and a predetermined value entered by the operator.
3.2.4.1 RF frequency error measurement accuracy: ±1 Hz + the time base accuracy
3.2.4.2 RF frequency error measurement resolution: 1 Hz or less
3.2.4.3 RF frequency error measurement range: ±10 kHz minimum

3.2.5 FM deviation measurement: At RF frequencies from 5 MHz to 999.99 MHz and modulation frequencies of 150 Hz to 10 kHz
3.2.5.1 FM deviation measurement range: 1 kHz to 25 kHz peak deviation
3.2.5.2 FM deviation measurement accuracy: ±7.5% of indication plus peak residual FM
3.2.5.3 FM input sensitivity: 5.0 μV at 10 dB EIA SINAD

3.2.6 AM depth measurement: At RF frequencies from 10 MHz to 999.99 MHz and modulation frequencies of 300 Hz to 10 kHz
3.2.6.1 AM depth measurement range: 0 to 90%
3.2.6.2 AM depth measurement accuracy: ±8% FS + 1 LSD

3.2.7 Signal strength measurement: A means shall be provided to measure the relative level of off-the-air signals received by an antenna supplied with the instruments.
3.2.7.1 Measurement frequency range: 3 MHz to 999.99 MHz
3.2.7.2 Measurement level range: -100 dBm to +10 dBm

3.3 RF Wattmeter An RF wattmeter and load shall be provided to measure the power generated by units under test at frequencies above 1.5 MHz, and to terminate a 50 ohm system with an SWR of 1.25:1 or less up to 500 MHz and 1.35:1 or less from 500 MHz to 999.99 MHz.

3.3.1 RF wattmeter power measurement
3.3.1.1 RF wattmeter power measurement range: 1 mW to 60W
3.3.1.2 RF wattmeter power measurement accuracy: ±10% of indication for inputs > 200 mW

3.3.2 Wattmeter over-temperature protection: Visual and audible over-temperature warnings shall be provided.

3.4 Duplex Generator A duplex generator function or other means shall be provided to test equipment transmitting and receiving simultaneously on offset frequencies.

3.4.1 Duplex frequency offset: Full offset capability shall be provided.

3.4.2 Duplex output:
3.4.2.1 Output level: At least -110 dBm to 0 dBm
3.4.2.2 Resolution: 0.1 dBm

3.4.3 Duplex generator deviation: The carrier shall be capable of being frequency modulated at deviations from 0 to 25 kHz peak.

3.4.4 Sensitivity: In duplex mode, the equipment shall operate properly with input levels of 20 mW or less.

3.4.5 Connector: BNC female or compatible via adapter

3.5 Oscilloscope An oscilloscope function shall be provided to monitor the modulation characteristics of AM and FM signals.

3.5.1 Display size: At least 9 $in^2$ (58 $cm^2$)

3.5.2 Frequency response: At least 2 Hz to 20 kHz
.
3.5.3 Vertical input ranges: 10 mV to 10 V/div

3.5.4 Oscilloscope horizontal sweep rate: 100 µs/div to 20 ms/div

3.6 AF Frequency Measurement A frequency counter function shall be provided to measure audio frequencies.

3.6.1 Measurement range: 20 Hz to 20 kHz

3.6.2 Measurement resolution: 1 Hz

3.6..3 Measurement accuracy: ±2 counts

3.7 AF Signal Generator Two independent variable audio frequency signal generators shall be provided to generate the tones required by various two-tone signaling systems such as DTMF.

3.7.1 Frequency range: 10 Hz to 20 kHz

3.7.2 Frequency resolution: 1 Hz

3.7.3 Output level: 4 Vrms into 600 ohms, balanced or unbalanced

3.8 SINAD Meter A means shall be provided to measure the sensitivity of a receiver with respect to the ratio of the signal plus noise and distortion to noise and distortion.

3.8.1 Input Frequency: the equipment shall provide a test signal modulated by 1 kHz to the receiver under test.

3.8.2 Input Level Range: 0.1 Vrms to 10 Vrms

3.8.3 Measurement range: 3 dB to 30 dB

3.8.4 Measurement accuracy: ±1.0 dB at 12 dB EIA SINAD

3.9 Distortion Measurements

3.9.1 Fundamental frequency: 1 kHz nominal

3.9.2 Level range: 100 mVrms to 10 Vrms

3.9.3 Distortion range: 1% to 20 %

3.9.4 Distortion accuracy: ±2 dB

3.10 AF Voltmeter An AF voltmeter shall be provided for DC and AC voltage measurements.

3.10.1 AC measurements:
3.10.1.1 Frequency range: 50 Hz to 20 kHz
3.10.1.2 Level range: 0 to 30 Vrms
3.10.1.3 Accuracy: ±(3% of indication + 3 mV + 1 LSD)

3.10.2 DC measurements:
3.10.2.1 Level range: 0 to 40 V
3.10.2.2 Accuracy: ±(1% of indication + 50 mV)

3.11 Time Base

3.11.1 Accuracy: ±0.1 ppm

3.11.2 Aging: 0.5 ppm per year

3.11.3 Temperature stability: ±0.05 ppm from 0 to 55°C

3.12 Loud Speaker The equipment shall contain an internal speaker.

3.13 Reference Frequency Input 5 MHz

3.14 Spectrum Analyzer The equipment shall be provided with a spectrum analyzer in accordance with the following specifications:

3.14.1 Frequency range: 400 kHz to 1 GHz

3.14.2 Scan widths: At least 50 kHz to 1 MHz/div

3.14.3 Resolution bandwidths: 300 Hz to 300 kHz

3.14.4 Sensitivity: -95 dBm at lowest resolution bandwidth

3.14.5 Dynamic range: 80 dB displayed range

3.14.6 Display log scales: At least 10 dB/div

3.14.7 Average noise level: Less than -90 dBm at the lowest resolution bandwidth

3.14.8 Level accuracy: ±3 dB

3.14.9 Markers: Independently tunable markers shall provide readouts of frequency and amplitude for any point and relative readings between center frequency and any other point.

3.14.10 Tracking generator: A tracking generator shall be provided that has frequency and output power equivalent to that of the signal generator (see 3.1.1 and 3.1.4).

3.15 Audio Filters 50 Hz high-pass, 300 Hz high-pass, 15 kHz low-pass, 3 kHz low-pass and 1 kHz notch.

3.16 Signaling The unit shall provide a selective call encoder/decoder with the capability to generate and analyze common signaling formats used in mobile radio, cellular phones and trunked radio systems. Signaling formats supported shall include, but not be limited to, DTMF, 1 Tone, 2 Tone, Tone Sequential, AMPS and TACS.

3.17 Programming The unit shall provide a means of performing preprogrammed test routines under control of a built-in computer with at least 40k bytes of on-board RAM. The unit shall include the capability of loading automated test routines from either memory cards or from floppy disks. Software to automatically perform radio tests such as intermodulation products tests shall be provided.

3.18 Accessories For audio analysis, the equipment shall be provided with a 600 ohm input impedance or a 600 ohm balanced interface as an accessory.

3.18.1 A video tape (VHS format) showing the features and basic operation of the portable radio test set shall be provided.

4.0 GENERAL REQUIREMENTS

4.1 Power Source MIL-T-28800 nominal AC and external DC power source requirements are invoked.

4.1.1 Maximum AC power consumption: 250W

4.1.2 External DC Power: 11-28 VDC at 120 W maximum power consumption. The equipment shall be provided with a DC power cord for connecting to external DC sources.

4.2 Lithium Batteries Per MIL-T-28800, lithium batteries are prohibited without prior authorization. Requests for approving the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed

4.3 Weight 21 kg (46 lb) maximum

4.4 Digital Interface A digital interface shall be provided in accordance with MIL-T-28800.